

COUNTRY STATEMENT - U.S.A.

1. FISHERIES ADMINISTRATION

The primary functions of the National Marine Fisheries Service (NMFS) are divided among four major components: Resource Research, Resource Utilization, Resource Management, each headed by an Associate Director, and International Fisheries, headed by an Assistant Director. Under each of the four major components are varying numbers of field units. In addition, the field structure consists of five Regional Offices, each headed by a Regional Director.

In 1975, 10 ships of the National Oceanic and Atmospheric Administration (NOAA) fleet carried out seagoing survey and research tasks of NMFS. This fleet of larger vessels is managed by the National Ocean Survey's (NOS) Office of Fleet Operations (OFO). Several NMFS stations and laboratories also operate small- and medium-sized research vessels not managed by NOS. The 10 ships in the NOAA fleet include the Miller Freeman and John N. Cobb based in Seattle, Washington, David Starr Jordan based in San Diego, California, and the Townsend Cromwell based in Honolulu, Hawaii.

2. PLANNING

In recognition of the tremendous demands being made on the living marine resources of the contiguous waters of the United States and its territories, and in anticipation of the potential increased future demands on those resources, NMFS and NOAA prepared a discussion paper in 1975 entitled "Fisheries Management Under Extended Jurisdiction: A Study of Principles and Policies." This document contributed to the policy framework to the legislation that was being considered by Congress and resulted in the passage of P.L. 94-265, The Fishery Conservation and Management Act of 1976, in early 1976. This law will provide new management authority to greatly improve the opportunities for conservation of recreational and commercial fishery stocks out to 200 nautical miles of the United States and U.S. territorial coasts. In anticipation of the passage of this law the Director of NMFS formed a task force to review organization management in NMFS and to propose changes in the organization and in management processes that will help meet the demands that will be created by extended jurisdiction.

NMFS, in cooperation with State governments, is developing plans aimed at rehabilitating U.S. marine fisheries which are suffering from the effects of heavy fishing and environmental changes. Known as the National Fisheries Plan, its preparation was recommended by the President's National Advisory Committee on Oceans and Atmosphere. A task force has drafted an outline of the plan which describes the present problems facing U.S. fisheries and discusses a series of major issues of primary concern to our national goals in fisheries and related activities.

3. MARINE RESOURCES

3.1 Resource surveying, experimental and exploratory fishing, location of new fishing grounds

The field research work in NMFS is primarily carried out by the various laboratories in the seven regional fisheries research centers under the Office of Resource Research. In the northeastern U.S., NMFS laboratories in collaboration with other members of the International Commission for the Northwest Atlantic Fisheries (ICNAF) intensively monitored the production and dispersal of larval sea herring, particularly in the Georges Bank-Nantucket Shoals areas. The status of the total resource under harvest in the northwest Atlantic south of Nova Scotia was investigated and summaries of these studies provided major inputs to the management discussions within ICNAF.

The continental slope of the northeastern U.S. was surveyed and information was obtained on the size of the red crab population, their distribution and on their size and sex composition. This information is critical in predicting the availability and for monitoring the developing New England red crab fishery.

Surveys are being conducted in the north central Gulf of Mexico to assess the vast groundfish resource and to determine the amount of groundfish discarded by the Gulf shrimp industry. Assessment of the groundfish resources from Seward in the Gulf of Alaska to Unalaska Bay in the Aleutians was completed in 1975. The assessment indicated that the Kodiak Island and Sanak to Unalaska Bay areas held the best potential for U.S. fishermen.

In 1975 the Townsend Cromwell, presently assigned to the Honolulu Laboratory of the Southwest Fisheries Center (SWFC) completed a preliminary survey of the Northwestern Hawaiian Islands. This preliminary cruise is part of a proposed cooperative survey and assessment of the marine resources of the Northwestern Hawaiian Islands to investigate the terrestrial, nearshore, slope, and pelagic resources of the area and their interrelationships.

3.2 Fisheries biology (including methodology and techniques), studies on age determination, tagging, population dynamics

An otolith workshop attended by 21 scientists from various fisheries research organizations from around the world was held in early 1976 at the Scripps Institution of Oceanography and at the SWFC, La Jolla, California. The agenda of the workshop included presentation of papers relating to problems of incremental growth in otoliths of larval and adult marine and freshwater fishes. An important aspect of the workshop was the opportunity to examine otolith samples from various species of fish and to exchange information on the interpretation of readings among the participants.

A workshop on the population dynamics of the North Pacific albacore was held at the Honolulu Laboratory, SWFC, in December 1975. The workshop was part of an informal agreement between the SWFC and the Far Seas Fisheries Research Laboratory (FSFRL), Shimizu, Japan, to promote and accelerate cooperative North Pacific albacore research. Participants included scientists from NMFS, FSFRL, California Department of Fish and Game, Oregon Department of Fish and Wildlife, Washington Department of Fisheries, and the Pacific Marine Fisheries Commission. Based on standard analyses of catch, effort, and size composition statistics the workshop tentatively ascertained that the maximum sustainable annual yield of the North Pacific albacore stock was in the neighborhood of 115,000-125,000 MT (metric tons).

The Inter-American Tropical Tuna Commission (IATTC) continued to give considerable emphasis to tagging studies. Greater emphasis was given to tagging yellowfin tuna because this species is much more heavily exploited than skipjack tuna in the areas of recent heavy fishing. In 1974, 8,670 yellowfin tuna were tagged; 186 of these were recovered in 1974 and 122 were recovered in 1975. During the same period 48 skipjack tuna were tagged, with no recoveries.

In an integrated approach to fishery management the NMFS Middle Atlantic Coastal Fisheries Center (MACFC) established a biometrics unit in 1975. Using data from various sources including commercial landings and recreational creel surveys the unit developed yield models of the important middle Atlantic fisheries for summer flounder and butterfish, and modeling of the fisheries for scup and surf clam has begun.

3.3 Fisheries oceanographic studies

Some significant accomplishments in fisheries oceanography in 1975 included the development of an index that relates the effect of wind on ocean surface convergence/divergence. Oregon State University scientists used this material along with previously developed upwelling index time series and applied it to a stock-recruitment model of the Pacific mackerel fishery. The model predicts nearly 80% of the variance in recruitment.

Ultrasonic tracking of albacore concurrent with oceanographic measurements by the La Jolla Laboratory, SWFC, demonstrated that oceanographic conditions play an important role in the concentration and movement of albacore in U.S. coastal waters. Temperature fronts caused by upwelling markedly influenced the local concentration of albacore. Albacore tended to concentrate in the vicinity of these fronts, presumably to feed, and moved away from the immediate area when the upwelling-caused fronts dissipated.

Experiments recently conducted at the NMFS Honolulu Laboratory on captive skipjack tuna, Katsuwonus pelamis, have provided crucial new information on the temperature and dissolved oxygen requirements of this species. If these experimental laboratory results apply to skipjack tuna in the open ocean, they may account for many of the peculiar features of their geographic distribution, and explain why skipjack tuna are seldom

seen in the open ocean even though they appear to be relatively abundant in many areas. These experiments suggest that the actual habitat of adult skipjack tuna in the tropics is the upper thermocline and not the surface mixed layer, as has generally been thought; and that in the eastern tropical Pacific Ocean, and probably in other oceans, certain areas are too warm and oxygen-poor to support this species after they have grown beyond the juvenile or adolescent stage.

The IATTC is continuing work on relating thermal infrared data from satellites to fish catch data. Statistically significant associations were found in a comparison of scanning radiometer (SR) and fish catch. SR has a ground resolution of 10 km and is being gradually superseded by the very high resolution radiometer (VHRR) which has a ground resolution of about 1 km. IATTC work during 1975 was devoted to comparing the quality and utility of VHRR and SR data with that of ocean color data obtained from the earth resources technology satellite (ERTS-1).

3.4 Management laws and regulations, control of pollution

Analysis of the natural production of sockeye salmon in the Naknek and Ugashik Lakes systems of Bristol Bay, Alaska provided revised estimates of adult escapements to each lake system. These escapement figures have direct application to forecasting sockeye salmon returns in Bristol Bay. Also being evaluated is a method of using scale characters to differentiate the Alaska and Asia components of the Japanese high-seas catches of chinook salmon. Estimates by time and area of Japanese mother ship catches of Alaskan sockeye salmon were used to negotiate protection for the 1975 run from high-seas salmon fisheries. This information on interception of U.S.-Canada salmon by Japanese fisheries was compiled for bilateral discussions in early 1976.

Drawing on the results of various analyses a package of conservation recommendations on the major fishery resources of the northeastern Pacific and eastern Bering Sea was developed. These recommendations were utilized by the U.S. in bilateral discussions with the Soviet Union and Poland which resulted in agreements that, for the first time, placed some degree of control over the fisheries of those nations in coastal waters of the United States.

The long-term NMFS objectives of environmental and ecological research are to determine the factors influencing the production of living marine organisms and to obtain baseline data to evaluate the ecological impact of man-induced and natural alterations. Studies are conducted also on the cycling of pollutants through food chains and their effects on marine ecosystems and organisms. Research continued on the relation between petroleum oil and aquatic organisms at the Northwest Fisheries Center (NWFC) installations at Seattle, Washington, and Auke Bay, Alaska. The MACFC established a National Registry of Marine Pathology, which provides reference service for clinical, illustrative, and published materials on diseases of marine and estuarine vertebrates and invertebrates.

3.5 Research programs and institutions

The National Sea Grant Program is administered by the National Oceanic and Atmospheric Administration (NOAA). As of June 1976, ten select colleges and universities have been designated Sea Grant Colleges. The Secretary of Commerce may confer Sea Grant College status on institutions in recognition of its excellence in its marine program. The Sea Grant institutions have highly individual programs serving diverse regions of the country in programs of applied research, education, and advisory service in the marine field.

4. AQUACULTURE

4.1 Intensive and extensive culture techniques--increase in yields

Research supported in the Aquaculture Program of NMFS is aimed at making commercial production of selected species economically feasible in order to encourage the private sector to invest in aquacultural ventures. In addition, research is centered around the improvement of natural stocks for recreational and commercial fishermen. In 1975 work continued on such species as Pacific salmon, penaeid shrimp, blue crabs, and mollusks (oysters, clams, and scallops).

Research on salmon at the Northwest Fisheries Center included development of technology to restore depressed salmon stocks by the release of juvenile salmon produced by new hatchery methods at the Auke Bay, Alaska, Laboratory. Pilot demonstration projects resulted in the production of 35,000 adult salmon (100 MT) in 1975. The number of fish returning per spawner was from 5 to 15 times greater than natural recruitment.

In a molluscan aquaculture program that was reestablished in 1975 at the Milford, Connecticut Laboratory of the MACFC, important programs will include the prophylaxis and treatment of diseases of larvae and juveniles of shellfish species produced in hatchery systems; genetic research on shellfish to develop strains suitable for hatchery use; determining the feasibility of replacing living foods with partially or wholly synthetic foods to satisfy the nutritional requirements of mollusks; and developing laboratory techniques to spawn, rear, and maintain commercial and potentially valuable marine mollusks.

At the Gulf Coastal Fisheries Center (GCFC), Galveston, Texas, in collaboration with scientists at Texas A&M University, shrimp studies continued to help solve problems inhibiting the growth of commercial shrimp farming. Accomplishments included the maturation and spawning of the shrimp, Penaeus stylirostris that had been overwintered in raceways before their return to the ponds; maturation and spawning of specimens in the laboratory; development of portable raceway systems with temperature controls; and construction of new filtration equipment for waste removal and water recycling.

Pilot farm operations conducted cooperatively by the Hawaii Division of Fish and Game (HDFG) and industry for the past several years have resulted in the development of a fledgling Macrobrachium rosenbergii aquaculture industry in Hawaii. In a cooperative arrangement with prawn farmers, HDFG has been providing 2,700,000 juvenile prawns to nine independent prawn farmers who are rearing prawns commercially in a total of about 11.3 ha. (28 acres) of ponds. Annual production was expected to reach about 39,000 kg (85,000 lb) in 1975.

In the State of Washington methods of collecting oyster seed from local oyster beds have been developed to such a stage wherein the State's oyster industry now obtains 80% of its seed requirement domestically and is no longer dependent on importation of seed stock from Japan.

4.2 Feeding, feedstuff

Studies on the nutritional requirements of juvenile blue crabs maintained in artificial seawater were carried out at the Southeast Utilization Research Center. These studies included evaluations on the effect of growth rates caused by different levels of dietary proteins and amino acid supplements. Also effects of increased levels of dietary carotene, background light, and dietary cadmium on survival, growth, and physiology of the blue crabs were investigated.

Components and byproducts of underutilized species, fishery wastes, and other sources were evaluated for use as fish feeds at the Pacific Utilization Research Center.

Studies related to the use of carotenoid pigments from crustacea continued. It was determined earlier that carotenoid pigments impart a desirable red coloration to salmonid flesh, enhancing their marketability. A process to extract carotenoid pigments from crustacea and crustacean wastes was developed. In a study of the use of single cell protein (SCP) derived from yeast as a substitute feed for conventional pen-reared salmonid feed, it was found that substitution of SCP for up to 50% of the protein did not adversely affect the growth rate.

5. INFRASTRUCTURE

A new shipping method to transport live dungeness crabs over relatively long distances has been tested successfully by the NMFS laboratories at Seattle, Washington. This new method may make possible the sale of new varieties of shellfish to consumers far from the site of the catch. The new technique involved the use of an 8.2 m (27 ft) long trailer truck which was lined inside with fiberglass and equipped with a refrigerated seawater circulating system. About 4,800 large dungeness crabs (about 3.6 MT) can be shipped using this system.

6. FISH CAPTURE

6.1 Improvements in materials, design and operations, and introduction of new types of gear

A porpoise/tuna interaction program was a high priority activity of the SWFC in 1975. The program was directed at developing fishing gear to reduce porpoise mortality that occurs during purse seining on yellowfin tuna associated with porpoises in the eastern tropical Pacific. Promising gear innovations have been tested including porpoise safety panels, porpoise aprons, and speed boats to hold the nets open to prevent porpoises from being entangled in the nets and drowning during purse seining operations.

At the NWFC a trawl designed to be selective for pollock and to avoid incidental catches of halibut and crab in the Bering Sea pollock fishery has been tested. The results of the tests are being evaluated and a prototype design is being developed.

6.2 Fish detection, sonar

Preliminary analyses of onsite and satellite data from the LANDSAT (formerly ERTS Satellite) follow-on program indicate that good fish areas may be identified from satellite multispectral scanner data alone. In another development, a towed-array hydroacoustic system developed by the NWFC in cooperation with the Applied Physics Laboratory of the University of Washington has been tested and is being used in the fish stock assessment survey in the northeast Pacific.

7. UTILIZATION

7.1 Improvement in fresh fish handling, distribution, ice supply

Vessels chartered by the New England Fisheries Development Program demonstrated improved on-vessel holding techniques for trawl-caught industrial fish. Fish held in chilled seawater appeared to be superior in quality to those held in conventional iced storage. Based on this initial finding, a herring transport vessel was converted to accommodate bulk holding in chilled seawater. The vessel's holding tank held 56.7 MT (125,000 lb) and in holding experiments maintained herring catches in food-grade condition for up to 60 hours. Present methods allow a holding time of only 5 to 6 hours.

7.2 Product development, new processing methods and equipment

The Texas A&M University, with assistance from the Southeast Utilization Center (SEUC), established a pilot minced fish processing plant at Corpus Christi, Texas. The research aimed at the technical feasibility of producing blocks of minced flesh from groundfish species in the Gulf of Mexico, which culminated in the establishment of the pilot plant, represents a milestone in NMFS efforts to increase use of Gulf groundfish.

In an economic study conducted for the New England Fisheries Development Program, it was indicated that a viable squid fishery off the New England coast could add over \$600,000 a year to the economy of the region. Squid is presently one of the marine organisms underused by Americans. Of the approximately 31,752 MT (70 million pounds) of squid taken in northeast U.S. waters by foreign and U.S. boats in 1973, only about 1,588 MT (3.5 million pounds) were landed by U.S. boats. Most of the squid landed by U.S. fishermen in this region is taken incidentally while trawling for cod, flounders, haddock, and other fish.

7.3 Research activities and institutions

NMFS issued the First Interim Report of a study on trace elements in fish and shellfish which included data on nine elements in 106 species. When completed this study will provide data on baseline levels for 15 trace elements on over 200 species of U.S. fish and shellfish of significant commercial and recreational interests, and will represent the most comprehensive survey of trace elements in fish and shellfish.

Sea Grant chemists at the Berkeley campus of the University of California have devised a straightforward and uncomplicated procedure that is a hundred times more sensitive than any previous method for detecting the presence in shellfish of saxitoxin. Saxitoxin is the paralytic shellfish poison sometimes associated with the so-called "red tide" blooms on the west coast. The new technique could provide a more scientific approach to the problem of shellfish poison than seasonal closings now in effect.

8. FINANCING THE INDUSTRY

8.1 Government aid to the industry including subsidies

The Financial Assistance Division administers four activities: the Fishing Vessel Obligation Guarantee Program; Fishing Vessel Capital Construction Fund; Fisheries Loan Fund; and, the Fishermen's Guaranty Fund. These programs are aimed at making the harvesting segment of the fishing industry more efficient and competitive by assisting industry in financing investments in vessels and gear. The Fishermen's Guaranty Fund indemnifies against financial losses of U.S. vessels seized by foreign nations. Guaranteed financings in 1975 had an average maturity of 13.5 years and the interest rate averaged 8.74%. Outstanding guarantees and pending applications at the end of 1975 totaled \$41 million.

9. STATISTICS

Efforts to improve cooperative State/Federal statistics programs continued in 1975. Most of the Atlantic and Gulf Coast states now cooperatively collect commercial fishing data with NMFS. A few states such as Florida and Texas also process the data for publication, a task which was formerly handled by NMFS. Several noncoastal states presently collect

and furnish data on their own inland fisheries. To eliminate certain duplication of data collection effort from fish processing firms, Washington State will take over almost the entire task formerly done by NMFS. And finally, there has been progress in developing a coastwide fisheries data system with California, Oregon, and Washington.

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